

# **DIGITAL IMAGE DEVICE AND CONTROL METHOD THEREOF WITH IMPROVED MOVEMENT DIRECTION INDICATION WHEN DISPLAYING IMAGE INFORMATION**

**[0001]** This application claims the benefit of Korean Patent Application No. 2002-79697 filed December 13, 2002 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference in its entirety.

## **BACKGROUND OF THE INVENTION**

### **1. Field of the Invention**

**[0002]** The present invention relates to a digital image device and a method for controlling the same, and more particularly, it relates to a digital image device, which can readily distinguish the movement direction of an icon moving between a plurality of image information when displaying the image information and a method for controlling the same.

### **2. Description of the Related Art**

**[0003]** A digital camera is a digital image device for recording and replaying a captured image of an object. One example is a digital still camera (DSC), which is mainly used in photographing a still image. Since the capacity of an installed recording medium is small, the DSC is usually used for still images although it may record a motion picture.

**[0004]** A DSC photographs still images of an object through an operation of a shutter, and photographed still images may be divided and recorded in several pieces according to the capacity of a recording medium. Also, the recorded still images are displayed on a display device such as LCD (Liquid Crystal Display) so that a user can confirm photographing

conditions.

[0005] FIG. 1 illustrates an exemplary image being displayed on the entire surface of a display unit equipped in a conventional DSC. FIG. 2 illustrates a plurality of images being displayed on an entire surface of a display unit equipped in a conventional DSC.

[0006] When a still image recorded on a recording medium, i.e., the image information of an object, is displayed on a display unit (d) equipped in a DSC, the DSC displays only one image on the entire surface of the display unit (d), as shown in FIG. 1, or displays a plurality of images (e.g., image 1 to image 6) by dividing the surface of the display unit (d) into a plurality of picture planes as shown in FIG. 2(a) when needed. Particularly, when a plurality of images are displayed on a multi-screen, as shown in FIG. 2(a), a user can more readily confirm photographing conditions of the taken images.

[0007] Here, an icon to indicate a direction is displayed beneath any one of the plurality of images (image 1 to image 6). The icon is a kind of a cursor moving between images (image 1 to image 6) by manipulation of a direction key equipped in the DSC to inform a user of a location of the present image information.

[0008] For example, when a direction key (not shown) is manipulated to display the next image information in FIG. 2(a), the icon moves from beneath the present image displayed as image 2 to beneath the next image displayed as image 3 to show the location of the next image information. Here, a user can obtain the location and moving direction of the icon with the icon itself.

[0009] On the other hand, when a direction key (not shown) is manipulated to display the present image, which is the image before the image 3 in a state of FIG. 2(b), the icon moves beneath the present image displayed as image 2, as shown in FIG. 2(a). However, this poses inconvenience to the user, since the location of the icon is shown with the icon itself but the moving direction of the icon is not shown. That is, the user may not

able to ascertain the heading direction of the present icon, since the direction of the icon is displayed in the same direction regardless of whether the icon moves forward from the present image to the next image or backward from an image to a previous image.

## SUMMARY OF THE INVENTION

**[00010]** The present invention has been developed in order to overcome the above problem and to realize advantages over conventional digital image devices. A digital image device is provided in accordance with the present invention that displays one or more digital images, as well as adaptively displays an icon proximally to a selected image in accordance with manipulation of a direction key by a user when selecting which digital image(s) to display. The icon indicates not only a current position or active image but also the moving direction of desired image review.

**[00011]** In accordance with an aspect of the present invention, a digital image device for generating digital images comprises (1) at least one memory device for storing the digital images and at least one icon for indicating image display direction; (2) a user input device for receiving user input commands comprising commands to retrieve selected ones of the digital images from the memory device for display; (3) a display device for displaying at least one of the digital images on a display screen; and (4) a processing device connected to the memory device, the user input device and the display device, and programmable to control the retrieval of at least one of the digital images and the icon from the memory device for display via the display device in response to one of the commands, to control the sequential display of the digital images in the memory device via the display device, and to configure the display of the icon to move to the next digital image in the sequential display of the digital images that is selected via one of the commands and to indicate one of a forward direction and a backward direction depending on whether the command selected the next digital image

and the previous digital image, respectively, in the sequential display of the digital images.

**[00012]** In accordance with another aspect of the present invention, the user input device comprises a forward image display direction button and a backward image display direction button for selecting, respectively, the next digital image and the previous digital image in the sequential display of the digital images.

**[00013]** In accordance with yet another aspect of the present invention, the user input device comprises a button for selecting a single mode or multi-mode of operation corresponding, respectively, to the display of a single digital image on the display screen, or the display of multiple digital images simultaneously on the display screen. When in multi-mode, the multiple digital images can be displayed in sequential order on the display screen. The processing device is programmable to move the icon to a corresponding one of the multiple digital images as they are selected via the commands and to configure the direction of the icon to indicate one of a forward direction and a backward direction depending on whether the next selected one of the multiple displayed images is the next or previous digital image in the sequential order

**[00014]** In accordance with still yet another aspect of the present invention, one of a forward direction icon and a backward direction icon are selectively controlled by the processing device to be displayed proximally to a selected one of the digital images being displayed via the display device depending on whether the command selected the next digital image and the previous digital image, respectively, in the sequential display of the digital images. Alternatively, the processing device can selectively rotate the at least one icon for indicating image display direction on the display screen to indicate a forward direction icon and a backward direction icon depending on whether the command selected the next digital image and the previous digital image, respectively, in the sequential display of the digital images.

**[00015]** In accordance with the present invention, a method of controlling the display of digital images on the display screen of a digital image device is provided which comprises the steps of: (1) receiving a user command to select and display at first one of the digital images; (2) displaying the first digital image on the display screen; (3) displaying an icon proximally to the first image on the display screen to indicate that the first digital image is the selected image; (4) receiving a second user command to select a second one of the digital images in the sequential display; and (5) displaying the icon proximally to the second digital image that indicates a forward direction or a backward direction depending on whether the second user command selected the next digital image or the previous digital image, respectively, in the sequential display of the digital images as the second digital image.

**[00016]** The method can further comprise the step of moving the icon from a first digital image to a second digital image when the digital image device is operable to display a plurality of the sequential display of digital images simultaneously on the display screen. The display of an icon can comprise the steps of: (1) storing a forward icon and a backward icon; and (2) selecting and displaying one of the forward icon and the backward icon depending on whether the user command selected the next digital image or the previous digital image, respectively, in the sequential display of the digital images. Alternatively, the display of an icon can comprise the steps of: (1) storing a single icon indicating a direction; and (2) rotating and displaying the icon to indicate one of a forward direction and a backward direction depending on whether the user command selected the next digital image or the previous digital image, respectively, in the sequential display of the digital images.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[00017]** The above and other objects, features and advantages of the present invention will

become more apparent from the following description when taken in conjunction with the accompanying drawings, in which:

[00018] FIG. 1 is a view illustrating a case where single image information is displayed on an entire surface of the displaying apparatus in a conventional digital still camera;

[00019] FIG. 2 is a view illustrating a case where a plurality of image information are displayed on the entire surface of the displaying apparatus in the conventional digital camera;

[00020] FIG. 3 is a block diagram illustrating a digital still camera according to a preferred embodiment of the present invention;

[00021] FIG. 4 is a view illustrating a case where a plurality of image information are displayed on a display unit in FIG. 3; and

[00022] FIG. 5 is flowchart illustrating a method of controlling a screen display for the digital still camera in FIG. 3.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[00023] A preferred embodiment of the present invention will be described below with reference to the accompanying drawings. In the following description, well-known functions or construction are not described since they would obscure the invention in unnecessary detail.

[00024] FIG. 3 is a block diagram illustrating a digital still camera (DSC) according to a preferred embodiment of the present invention. FIG. 4 is a view illustrating a case where a plurality of image information are displayed on a display unit in FIG. 3.

[00025] FIG. 3 is a block diagram of DSC comprising components for illustrating realization of multi-screen operation in accordance with the present invention. The block diagrams and descriptions illustrating the other functions and related functions of the DCS 300 will be omitted herein.

[00026] Referring to FIGS. 3 and 4, DSC 300 according to the present invention comprises a lens group 305, a photographing unit 310, a signal processing unit 315, a buffer 320, a codec unit 325, a first storing unit 330, a second storing unit 335, a graphic processing unit 340, a display unit 345, a command or order applying unit 350, a main storing unit 355, and a control unit 360.

[00027] The lens group 305 for photographing a still image of an object comprises at least one zoom lens (not shown) for magnifying or reducing the object, and at least one focus lens (not shown) for adjusting a focus in accordance with positions of the object and the zoom lens. The lens group 305 is moved by a driving unit (not shown) which is controlled by the control unit 360. The control unit 360 will be described later.

[00028] The photographing unit 310 transforms a still image signal of the object passed through the lens group 305 to an electric image signal by means of a charge coupled device.

[00029] The signal processing unit 315 removes noise included in the electric image signal outputted from the photographing unit 310, and amplifies a gain so that luminance of an image signal can be outputted on an even level.

[00030] The signal processing unit 315 transforms an analog image signal transformed to an electric image signal to a digital image signal, and outputs automatic control data to the control unit 360 through digital processing. The automatic control data are for the automatic correction of focus, exposure, color temperature and any operator hand tremors when using the DSC 300.

[00031] The buffer 320, which is a volatile memory such as SDRAM, is used by the control unit 360 to temporarily store information. In particular, the buffer 320 temporarily stores the transformed digital image signals. The temporarily stored digital image signals are either stored or deleted by a signal applied from the command applying unit 350, which will be described later.

[00032] The codec unit 325 compresses the digital image signal outputted from the signal processing unit 315 by using a compressing method such as JPEG.

[00033] The first storing unit 330 is a place where the image signal compressed by the codec unit 325, i.e., image information, is stored. Preferably, a recording medium such as a flash memory or a memory stick is used for the first storing unit 330.

[00034] If a play command signal with respect to the image information is inputted upon selection of a display mode by the command applying unit 350, which will be described later, the codec unit 325 releases compression of the image information stored in the first storing unit 330 under control of the control unit 360, and outputs the released image information to the graphics processing unit 340.

[00035] A forward direction icon (icon 1) and a backward direction icon (icon 2) to be displayed on the display unit 345 are stored in the second storing unit 335. For example, if multi-mode is selected by a mode selection unit 350a, which will be described later, not only the plurality of image information but also the forward direction icon (icon 1) or the backward direction icon (icon 2) are displayed beneath a corresponding one of the plurality of image information.

[00036] The forward direction icon (icon 1) and the backward direction icon (icon 2), which are one of several different cursor types that can be used, indicate, by moving between the plurality of image information, the location of the image information which can be currently activated. The forward direction icon (icon 1) and the backward direction icon (icon 2) may be positioned proximally to any one of the upper, lower, left or right edges of the image information, and have a shape of an arrow or a triangle or other shape that can indicate moving directions. Also, the forward direction icon (icon 1) and the backward direction icon (icon 2) indicate opposite directions.

[00037] The graphics processing unit 340 generates the image information, which is stored in



the first storing unit 330, or the forward direction icon (icon 1) or the backward direction icon (icon 2), which are stored in the second storing unit 330, as realizable image data in the display unit 345. In particular, if single mode or multi-mode is selected by the mode selection unit 350a of the command applying unit 350 that will be described later, the graphics processing unit 340 synthesizes the image information stored in the first storing unit 330 with the forward direction icon (icon 1) or the backward direction icon (icon 2), which is stored in the second storing unit 335, so as to generate the same as image data, which can be displayed.

[00038] Preferably, LCD panel is used for the display unit 345, which is an apparatus for displaying image data generated through the graphic processing unit 340.

[00039] The command applying unit 350 is a user interface, which output a command to select or perform functions of the DSC 300 to the control unit 360. For that purpose, the command applying unit 350 comprises not only the mode selection unit 350a and the direction key 350b but also manipulation buttons (not shown) such as plurality of numeric keys and confirmation keys.

[00040] The mode selection unit 350a is used to select a screen display mode for displaying image information stored in the first storing unit 330. A single mode option and a multi-mode option are provided on the screen display mode.

[00041] The single mode is a mode for displaying a single image information through the entire screen of the display unit 345, and the multi-mode is a mode for displaying a plurality of image information by dividing the screen of the display unit 345. The number of screens divided in the multi-mode may be set by the user or may be preset in the course of manufacturing the DSC 300. The present invention exemplifies a case of displaying six different image information by dividing the screen into six.

[00042] Also, if multi-mode is realized by the mode selection unit 350a, either one of the forward direction icon (icon 1) or the backward direction icon (icon 2) displayed on the

display unit 345 together with a plurality of image information is adaptively displayed on the display unit 345 in accordance with manipulation of the direction key 350b.

[00043] If the image information on the position where the forward direction icon (icon 1) or the backward direction icon (icon 2) is currently positioned is selected so as to perform deleting or magnifying function, etc., the control unit 360 adaptively performs the corresponding function. To be specific, the image information corresponding to the position of the forward direction icon (icon 1) or the backward direction icon (icon 2) is in an active state.

[00044] The main storing unit 355, which is a non-volatile memory such as EEPROM, stores diverse control programs related to performing the functions of the control unit 360.

[00045] The control unit 360 adaptively controls entire activities of the DSC 300 after receiving the signals applied from the command applying unit 350 through selection of key input and/or by the user, as well as the diverse control programs stored in the main storing unit 355 and the automatic control data of the signal processing unit 315.

[00046] The activities of the control unit 360 related to the present invention will now be described in further detail. For the sake clarity when describing the present invention, the image information where an initial icon is displayed will be referred to as present image information. The image information stored after the present image information will be referred to as next image information. The image information stored before the present image information will be referred to as previous image information. Also, the direction of selecting the next image information from the present image information will be referred to as a forward direction, while the direction of selecting the previous image information from the present image information will be referred to as a backward direction.

[00047] In the case where multi-mode has been selected through manipulation of the mode selection unit 350a, and if the next image information (e.g., image 3) is selected from the

present image information (e.g., image 2), or if the previous image information (e.g., image 1) is selected from the present image information (image 2) by the direction key 350b, the control unit 360 displays the forward direction icon (icon 1) or the backward direction icon (icon 2) stored in the second storing unit 335 on the display unit 345 in accordance with the signal applied from the direction key 350b. Through the manipulation on the direction key 350b, the user knows not only the location of the image information, but also the moving direction.

**[00048]** The moving direction may be indicated by diverse cursors of indicating different directions that are stored in the second storing unit 335(e.g., '►', '◄' etc.) Otherwise, it is also possible to control the graphic processing unit 340 so that a single cursor indicating a single direction can be stored, and that a moving direction such as a forward direction or a backward direction can be indicated by rotating the cursor with a predetermined angle when realized on the display unit 345.

**[00049]** If the multi-mode is selected by manipulation of the mode selection unit 350a, initial multi-screens, as shown in FIG. 4(a), are realized in the display unit 345. The forward direction icon (icon 1) is displayed on a lower tip of the present image information on the initial multi-screens. Here, if the active image information is changed to the next image information (image 3) from the present image information (image 2) by manipulation of the direction key 350b, i.e., if a command signal to move forward is applied, the control unit 360 controls the graphic processing unit 340 so that the forward direction icon (icon 1) can be displayed on the position as shown in FIG. 4(b). Here, the forward direction icon (icon 1) is displayed in the shape of "►" to indicate not only the current position of the forward direction icon(icon 1) but also the moving direction of the forward direction icon (icon 1).

**[00050]** Meanwhile, if the previous image information (image 1) becomes active by manipulation of the direction key 350b under the state as shown in FIG. 4(b), i.e., if a

command signal to move backward is applied, the control unit 360 controls the graphics processing unit 340 so that the backward direction icon (icon 2) can be displayed on the position as shown in FIG. 4(c). Here, the backward direction icon (icon 2) is displayed in the shape of "◀" to indicate not only the current position but also the moving direction of the backward direction icon (icon 2).

[00051] The forward direction icon (icon 1) or the backward direction icon (icon 2) as displayed by manipulation of the direction key 350b can be realized not only in the multi-mode but also in the single mode. In other words, the graphics processing unit 340 synthesizes the image information to be displayed using essentially the entire surface of the display unit 345, along with the forward direction icon (icon 1) or the backward direction icon (icon 2). Detailed description of the related operation will be omitted herein since it is similar to the operation in the multi-mode.

[00052] Further detailed description will now be provided on the operation of the control unit 360 when power has been supplied to the DSC 300.

[00053] FIG. 5 is a flowchart illustrating a method of controlling a screen display with respect to the DSC in FIG. 3.

[00054] Referring to FIGS. 4 and 5, if power is applied, the control unit 360 determines whether the mode is in a photographing mode for photographing an object or in a display mode for displaying the image information, which has been stored in the first storing unit 330, on the display unit 345 (S500).

[00055] If determined to be in a display mode in step S500, the control unit 360 confirms the selected screen display mode (S505). The screen display mode is classified into a single mode and a multi-mode. The mode is selectable and changeable with the mode selection unit 350a provided in the command applying unit 350.

[00056] If a multi-mode is confirmed in step S505, the control unit 360 sets a number of the

divided screens to be displayed on the display unit 345 (S510). The number of the divided screens may be preset in the course of manufacturing the DSC 300 or changeable by a separate manipulation button (not shown).

[00057] The present invention exemplifies a case of simultaneously displaying six image information by dividing the entire surface of the display unit 345 by six.

[00058] Once the number of the divided screens is set, the control unit 360 controls the codec unit 325 so as to read out a plurality of image information (image 1 to image 6) corresponding to the number of the divided screens from the first storing unit 330. The control unit 360 then releases the compression image formation (S515). In the illustrated embodiment, the plurality of image information (image 1 to image 6) is maximally six image information, including the previous/present/next image information (e.g., images 1, 2, and 3).

[00059] The control unit 360 generates and synthesizes the plurality of image information released by the graphics processing unit or graphics engine 340 and forward direction icon stored in the second storing unit 335 into displayable image data so as to be displayed on the display unit 345 as shown in FIG. 4(a) (S520).

[00060] If a command signal to move forward is applied by manipulation of the direction key 350b (S525), the control unit 360 controls the graphic processing unit 340 so that the forward direction icon (icon1) can be displayed on the lower tip of the next image information (image 3) as shown in FIG. 4(b) (S530).

[00061] Also, if a command signal to move backward is applied by manipulation of the direction key 350b (S535), the control unit 360 controls the graphic processing unit 340 so that the backward direction icon (icon2) can be displayed on the lower tip of the present image information (image2), which is a preceding image information of the next image information (image3) as shown in FIG. 4(c)(S540).

[00062] Meanwhile, if a mode is determined to be a photographing mode in step S500, the control unit 360 performs a photographing program routine (S545). To be specific, an image signal of an object inputted through the lens group 305 is transformed into an electric image signal through the photographing unit 310 and the signal processing unit 315. If a command to store the signal is applied from the command applying unit 350, the electric image signal is compressed and stored in the first storing unit 330.

[00063] Meanwhile, if a single mode is confirmed in step S505, the control unit 360 controls the codec unit 325, and reads out a predetermined image information, i.e., the present image information (not shown) to be displayed on the display unit 345, from the first storing unit 330. The control unit 360 then releases compression of the present image information (not shown) (S550).

[00064] Thereafter, the control unit 360 generates the present image information (not shown) released by the graphic processing unit 340 and the forward direction icon (icon1) stored in the second storing unit 335 into displayable image data, synthesizes the generated displayable image data, and displays the image data on the display unit 345 (S555).

[00065] If a command signal to move forward by manipulation of the direction key 350b (S560), the control section 360 releases compression of the next image information (not shown) so as to be displayed on the display unit 345 together with the forward direction icon (icon1). (S565). Also, if a command to move backward is applied by manipulation of the direction key 350b (S570), the control unit 360 releases compression of the previous image information (not shown) so as to be displayed on the display unit 345 together with the backward direction icon (icon2)(S575).

[00066] In the method of controlling the DSC 300 as described above, the forward direction icon (icon1) is displayed in steps S530 and S565 in accordance with the command signal to move forward, while the backward direction icon (icon2) is displayed in steps S540 and S575

in accordance with the command signal to move backward. This enables the user to easily obtain the displaying and moving direction through manipulation of the direction key 350b.

[00067] Also, the display control of the moving direction of the icon as described above is applicable not only to the DSC 300 but also to any apparatus that can realize multi-screens. An example is a combo-type photographing apparatus, which integrates the DSC 300 with a digital video camera.

[00068] The method of controlling the DSC 300 described above exemplifies realization of multi-screens for still images. However, the above method is also applicable to realizing active images on multi-screens if the recording medium of storing the active images has a large capacity.

[00069] The digital image device and the controlling method thereof according to the present invention has advantageous effects of enabling the user to easily discern the moving direction between image information due to adaptable display of a forward direction or a backward direction in accordance with the moving direction between the located image information, particularly in the case where a single screen has been divided into multi-screens and a plurality of image information is displayed.

[00070] While the invention has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.